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ABSTRACT

An examinee is required to express his confidence in the correctness of each choice of a multiple-choice item in a probabilistic test. For the responses to be valid indicators the confidence expressed in each choice should be determined by an examinees' knowledge. This study assessed the relationship of the certainty of examinees' responses to knowledge and selected personality traits. It was found that a reliable certainty of responses was exhibited by examinees. This certainty measure had a moderately high (.62) relationship to examinees' knowledge. The certainty of response was also related to risk taking holding knowledge constant. For related document see TM003533. (Author)

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THE CONTRIBUTION OF SELECTED PERSONALITY TRAITS AND KNOWLEDGE TO RESPONSE BEHAVIOR ON A PROBABILISTIC TEST

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ABSTRACT

An examinee is required to express his confidence in the correctness of each choice of a multiple-choice item in a probabilistic test. For the responses to be valid indicators the confidence expressed in each choice should be determined by an examinees' knowledge. This study assessed the relationship of the certainty of examinees' responses to knowledge and selected personality traits. It was found that a reliable certainty of response was exhibited by examinees. This certainty measure had a moderately high (.62) relationship to examinees' knowledge. The certainty of response was also related to risk taking holding knowledge constant.

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Objectives

The multiple-choice type test can be administered using a response system which permits an examinee to indicate the subjective probability of the correctness of each of the choices to an item. Such a test is referred to as a probabilistic test. This study was conducted to elaborate on the information which has been previously reported on the response behavior of Ss on probabilistic tests. If the results are found to be similar to previous studies, then this study would assist in the generalization of probabilistic test characteristics. If the findings were found to be different, then this study would assist in delimiting previous findings.

The research hypotheses generated for this study were that (a) a reliable variable of certainty of response can be measured using a probabilistic test, (b) this certainty of response can be reliabily measured with knowledge held constant, and (c) this certainty of response measure is significantly related to selected personality traits holding knowledge constant.

Theoretical Framework

deFinetti (1965) has considered the theoretical implications of a number of scoring systems which attempt to reflect partial knowledge by using subjective probabilities in probabilistic testing. Rippey (1970)

conducted a comparative study of different probabilistic scoring functions. In both studies evidence was presented that simple scoring functions had relatively positive characteristics when compared to complex scoring systems. By using relatively simple scoring functions, several studies have found that the reliability of a test can be increased.

If Ss respond to a probabilistic test in the intended manner, their responses should be determined primarily by the knowledge which is claimed to be measured by the probabilistic test. If the responses of Ss are partially governed instead by personality traits, then the validity of the test may be altered. Hansen (1971) investigated the influence of variables other than knowledge on the responses of Ss under probabilistic conditions. He found that Ss do respond to test items under probabilistic conditions with a certainty characteristic that was not accounted for by their knowledge.

This study was conducted to see if similar results to those in the Hansen study would be found using a different probabilistic scoring function, different testing conditions, and only a partial overlap of personality measures.

Methods

A simple scoring function was selected for this study in which Ss expressed their degree of confidence in each choice by distributing 5 points across the five choices on the test items, each point represented a probability of 0.2. The Ss had only 5 points to distribute across the choices for each item. The item score was the number of points S placed on the correct answer.

In the Hansen study, the spherical scoring function was used. That function differed from the function in this study in the options available

to the Ss as well as the method of scoring an item.

Studies of probabilistic tests have been reported which measure achievement in a course. Hansen's study was an example. In contrast, a vocabulary test was selected for this study which was not related to the course objectives. It was thought there was a lack of information regarding the characteristics of probabilistic tests which measure non-course type objectives. The vocabulary test consisted of 24 items from the I.E.R. Intelligence Scale (1946). Items were randomly selected from each of the five levels of the intelligence scale.

Personality measures of external control, risk taking, and cautiousness were obtained to assess personality traits that might bias the vocabulary scores under the testing condition of expressing subjective probabilities. The internal-external scale identified individuals according to differences in a belief in external control (Rotter, 1966). The Kogan and Wallach (1964) questionnaire assessed an individual's risk taking behavior and the Gordon (1956) Personal Inventory measured the general trait of cautiousness. Only the risk taking measure was among the instruments used in the Hansen study.

Hansen developed an index of certainty from the responses of Ss on a probabilistic test. This index of certainty is the average of the absolute deviations from a 1-1-1-1-1 response (assuming 5-choice item). Before computing the index all responses are converted to probabilities. The index is at a maximum when a single choice is assigned a probability of 1.00. This would be indicated by S placing 5 points on a single choice. The index is at a minimum when a probability of 0.20 is assigned to each choice as indicated by a 1-1-1-1-1 response.

The level of certainty of an individual might be accounted for by the knowledge of S. Therefore, the certainty index was adjusted for the linear

relationship of certainty and knowledge. A simple regression equation was developed using the certainty index as the criterion variable and the vocabulary knowledge score as the predictor variable. Following the procedure of Hansen, residuals between observed certainty scores and predicted certainty scores were calculated as measures of certainty with knowledge held constant. Estimates of reliabilities for these indices were calculated using analysis of variance.

Data Source

The Ss used in this study were graduate students enrolled in educational measurement courses in the School of Education at Indiana University. These courses were required for several degree programs and had students enrolled from several specialization areas. A sample of 56 Ss consisting of 40 females and 16 males was selected. The mean age of the sample was 26.3 years.

Prior to taking the vocabulary test all Ss were given a brief training session. The first part was a presentation by Es of the scoring function. The second part allowed Ss to use the probabilistic scoring system on practice test items.

Results

In Table 1, means, standard deviations, and reliability estimates are reported for the knowledge of vocabulary score, the observed certainty score, and the residual certainty score.

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The knowledge of vocabulary test scores had a consistency reliability of .66. The observed certainty measure had a reliability of .82 and the residual certainty measure had a reliability of .32.

The correlation between the knowledge of vocabulary scores and the observed certainty scores was moderately high, .62.

The correlation coefficients between the personality trait scores and the knowledge of vocabulary, the observed certainty and the residual certainty measures are reported in Table 2.

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The risk taking scores correlated significantly with both the observed and residual certainty measures ($p<.05$). All other correlation coefficients were insignificant.

Importance of the Study

The Ss tended to respond to the vocabulary items with a behavior that was consistently either certain or uncertain. This behavior was moderately high in relationship to knowledge of vocabulary but was not totally accounted for by their knowledge. The low but significant correlation between risk taking and residual certainty indicated that the response behavior was partly a function of Ss preference for risky options. Those Ss who scored higher in risk taking tended to be more certain in their responses than was typical for Ss with the same knowledge score.

In comparison to the Hansen study, both studies found reliable measures of observed certainty and residual certainty. The reliability of observed certainty was similar for the two studies but the reliability of residual certainty was appreciably lower in this study than in the Hansen study. Both studies found that a risk taking measure accounted for certainty of response behavior holding knowledge constant. A much higher relationship was found in this study between knowledge and certainty of response which contributed to the lower residual certainty reliability. One possible explanation of this

difference is that under course examinations of the Hansen study, additional factors entered into the response behavior of Ss that did not with the vocabulary test. Although there is increased evidence that factors other than knowledge enter into the response behavior on probabilistic tests, there is no evidence in either study that these factors are more operative than in traditional tests.

TABLE 1. MEANS, STANDARD DEVIATIONS, AND RELIABILITY COEFFICIENTS FOR MEASURES OF KNOWLEDGE OF VOCABULARY, OBSERVED CERTAINTY AND RESIDUAL CERTAINTY (N=56).

MEASURES	MEANS	STANDARD DEVIATIONS	RELIABILITY COEFFICIENTS
Knowledge of Vocabulary	50.57	12.32	.66
Observed Certainty	.54	.17	.82
Residual Certainty	.00	.13	.32[1]

[1]Estimated using the reliability of a difference score.

TABLE 2. CORRELATION COEFFICIENTS OF KNOWLEDGE OF VOCABULARY, OBSERVED CERTAINTY, AND RESIDUAL CERTAINTY WITH PERSONALITY TRAIT SCORES (N=56).

PERSONALITY TRAIT	KNOWLEDGE OF VOCABULARY	OBSERVED CERTAINTY	RESIDUAL CERTAINTY
External Control	-.131	-.008	.095
Risk Taking	.038	-.283*	-.328*
Cautiousness	.083	-.011	-.081

*$p<.05$

REFERENCES

deFinetti, B. Methods for discriminating levels of partial knowledge concerning a test item. The British Journal of Mathematical and Statistical Psychology. 1965, 18, 87-123.

Gordon, L. V. Gordon Personal Inventory. New York: World Book, 1956.

Hansen, Richard. The influence of variables other than knowledge on probabilistic tests. Journal of Educational Measurement, 1971, 8, 9-14.

Hansen, Richard A. The influence of variables other than knowledge on probabilistic tests. (Doctoral dissertation, Columbia University) Ann Arbor, Mich.: University Microfilms, 1970. No. 70-18, 811.

I.E.R. Intelligence Scale CAVD. New York: Columbia University, 1946.

Kogan, N., and Wallach, M. Risk taking, a study in cognition and personality. New York: Holt, Rinehart & Winston, 1964.

Rippey, R. M. A comparison of five different scoring functions for confidence tests. Journal of Educational Measurement, 1970, 7, 165-170.

Rotter, J. B. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 19-6, 80(1, Whole No. 609) 1-28.